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EDITORIAL
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CURRENT ORTHOPAEDIC LITERATURE

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Shows the under surface of the brace and the outer flange. B—The calcaneo-cuboid articulation. C—The extremity of the fifth metatarsal bone.

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The Journal of Orthopædic Surgery

PRESIDENTIAL ADDRESS 1921

BACKGROUNDS OF ORTHOPAEDIC SURGERY

BY ROBERT B. OSGOOD, M. D.

Fellows of the American Orthopedic Association, honorable colleagues from overseas, friendly guests: on behalf of the Boston members of the Association I extend to you a most cordial and sincere welcome.

It is my sad duty to record the death during the year of two eminent members of the Association, Dr. Arthur J. Gillette, on March 23, 1921, and Dr. Harry Sherman, on May 15, 1921. Their obituaries will be delivered at the first Executive Session.

Thirty-two years ago the third President of the American Orthopedic Association, Dr. E. H. Bradford, read before you an address on the History of Orthopedic Surgery, describing its development and outlining its future obligations.

Such a review furnishes a background by which we may judge the color values of our own effort. If certain ill conceived attempts have temporarily marred the picture, their discordant colors have faded into the whole, and against this background we may now recognize the clear cut image of new achievement.

It is possible that we may again with profit briefly review the work of a few masters. We shall make no attempt to cover the walls of the Orthopedic Hall of Fame with many well deserving names, but in stating what seem to us to be the essential principles of the specialty we shall pay tribute to a few great men who have embodied these principles in a peculiar way, demonstrating their soundness by the convincing success of their application.

I.

The Prevention of Deformity

The first clear voice which proclaims this chiefest aim is heard in France. It is that of Andry, who gave us the name "orthopaedia" in a two volume work published in the middle of the eighteenth century, (1743). "On the Art of Preventing Deformity in Children." He was at this time Professor of Medicine in the Royal College and Senior Dean of the Faculty of Physik at Paris. The titles of some of his chapters might head the writings of today, "The Means of Preventing the Bellies of Children from Projecting Too much Forward and How to Keep Their Backs Streight," "How They Ought to Sit to Produce This Effect: Particular Seats for This Purpose."

In Andry's treatment of existing deformity there is a strange mixture of tradition and common sense. Thus, in correcting a contraction of the Tendo Achilles, he strongly advocates rubbing the calf with "oil of worms" and bathing the leg frequently with a "bucket of tripe broth moderately warm." In addition, however, he directs these patients to persist in climbing the mountain of Sainte Genevieve and to tramp in the ditches of St. Victor.

In an elaborate thesis defended before the College of Physicians, he extols exercise as the great preventor of disease and the corrector of deformity, far more potent than unpleasant medicines which become so changed before they reach the blood that in great measure they lose their force. "Exercise is so useful and necessary that not only man, but the most inactive and indolent of the brute creation, nay even the plants themselves, cannot thrive without it. The humble violet as well as the lofty oak loves to be agitated by the winds."

If Andry was unable quite to shake off the shackles of an empirical and fanciful therapy, these shackles did not bind him nor did the occasional rattling of their chains make less distinct his loud call to more natural methods of cure.

II.

Rest as a Curative Agent in Diseases and Injuries of the Bones and Joints

England speaks in the person of John Hilton in the nineteenth century. "By regarding this subject of physiology and mechanical

rest in what I conceive to be its proper professional light, the surgeon will be compelled to admit that *he has no power to repair directly* any injury. It will induce him to acknowledge in all humility that it is the prerogative of nature alone to repair the waste of any structure; he will then realize that his chief duty consists in ascertaining and removing the impediments which obstruct the reparative process or thwart the effort of nature and thus enable her to restore the parts to their normal condition."

This acknowledgement of the limitations of surgery, this tribute to the potency of natural forces, did not come from one untrained or unskilled in surgery. At eighteen, he had entered the dissecting room of Guy's Hospital, and for over twenty years earned his living by demonstrating anatomy and physiology and performing post mortems. Then for twelve years he was Surgeon to Guy's and for twenty-five of the last years of his life a successful practitioner much in the public eye.

And if Hilton pursued the road of "rest" after it had become a byway and not the straight, short route to full function, he yet cleared a path which had become obscured, and this path has ever since remained open for us to follow in safety until we find a more sure and expeditious way to a common goal.

III.

The Rational Mechanics of Rest and Protection Necessary to the Successful Application of this Therapeutic Principle.

It required the analytical mind and mechanical ingenuity of Hugh Owen Thomas, another famous Briton, to make possible the procurement of this rest with greatest completeness and least discomfort to the patient.

Thomas was no mean surgeon, but it was his final belief that in bone and joint lesions the skillful use of the blacksmith's hammer could be depended on to bring about more cures than the knife of the surgeon. He came from a race of bonesetters and held no great teaching or hospital positions. His experience was gained from the droves of patients, mostly wage earners, who flocked to 11 Nelson Street, Liverpool, because they had learned that here relief from their physical ills could be found, as nowhere else. But

this was not all: sympathetic understanding of their mental distress was even surer than the benison of ease from pain. Rich and poor alike received this therapy of their souls. He died before his three score years, but not before, as a Fellow of the Royal College, he was recognized as a great surgeon and a master mind.

When we realize that the simple and mechanically perfect splints devised by him and his great inheritor, (Sir Robert Jones) who is fortunately with us today, saved more suffering and prevented more deformity than any other surgical method employed in the great war, we may in some measure appreciate the amount of tribute with which we should honor him and the magnitude of the debt we owe him. We as orthopaedic surgeons will never escape from the necessity of training ourselves in the use of apparatus nor in developing the faculty of invention by which we may be enabled to devise physical means which shall most perfectly fulfill the requirements demanded by an understanding of bodily mechanics.

IV.

Research and the Physiology of Surgery as Applied to Lesions of the Extremities and Spinal Column.

Whom shall we select from the not too great number of bone and joint surgeons who have appreciated the supreme importance of this method of attack? Perhaps Ollier, Professor of Clinical Surgery in the University of Lyons and Surgeon to the Hotel Dieu during the middle years of the 19th century. Ollier may be said to be the first great surgeon who recognized experimental physiology as the essential basis of all surgery. Like Lister, his great contemporary, he spent the first ten years of his professional life in physiological research. He possessed an open, unprejudiced mind so necessary to all who would search honestly for truth. Believing that the periosteum played no part in new bone formation, he became as a result of his experiments a disciple of Duhamel and Flourens, who held a diametrically opposite opinion.

That the true conception concerning the osteogenetic or non-osteogenetic function of the periosteum probably depends upon what elements we elect to include in the term "periosteum" detracts not one whit from the value of the experiments of Ollier or of Sir William MacEwen, that other great and almost contempo-

raneous physiological surgeon whose conclusions were opposed to Ollier's. An extraordinary number of fundamental conceptions concerning the growth and reaction of bone have sprung from the mind and work of Ollier. He typifies to us the spirit of patient unprejudiced research, eternally necessary to real progress in medicine.

"Of toil unsevered from tranquility
Of Labor that in lasting fruit outgrows
Far noisier schemes; accomplished in repose
Too great for haste, too high for rivalry."

V.

Anatomical Knowledge, General Training, and Technical Skill in Surgery.

To Italy we must turn for the most complete embodiment of these requirements of the Orthopaedic Surgeon.

Alessandro Codivilla, who died before his time and within the memory of all of us, devoted to the service of the art, an acute mind, a great heart, a modest forceful personality, and skill as a surgeon second to none. His Doctorate was received at twenty-five, and after many years of work as a general surgeon, during which time he made lasting contributions to the surgery of the brain and stomach, he became Professor of Orthopaedic Surgery in the University of Bologna and Director of the famous Istituto Rizzoli. He had always before him the broad humanitarian ideas of its founder and was universally recognized as the chief orthopaedic surgeon of Italy.

In Great Britain the foundations of the present orthopaedic surgery may be said to have been laid by William John Little; in France it was dignified and advanced by Jacques Delpech; in Italy its renaissance is due almost solely to Codivilla. To him we of this generation owe many things: valuable methods of reduction of congenital dislocation of the hip, the niceties of amputation technique, tendon transplantation and tenodesis, direct traction on bones for the reduction and alignment of fractures, osteoperiosteal bone grafts. But more than all we delight to name him an orthopaedic surgeon because after attaining eminence as a general surgeon, he devoted his life to that art which, as Biesalski has said, "requires

profundity of knowledge and acuteness and fineness of mind and hand perhaps more than any other branch of surgery."

It is with genuine pleasure that we welcome another eminent Italian surgeon (Prof. Vittorio Putti) whose flaming torch has been lit by Codivilla's fires.

VI.

The Segregation of Orthopaedic Cases Under Specially Trained Surgical and Nursing Groups. Hospitals for Crippled and Deformed Children. Orthopaedic Departments of General Hospitals for Adults and Children Under the Direction of Surgeons Specializing in the Care of the Handicapped.

Perhaps we shall be forgiven if with local pride we call attention to the fact that Buckminster Brown of Boston, charter member of this Association, succeeded in establishing a special ward for the treatment of deformities, which was the first in this country set aside for this purpose. This was in the House of the Good Samaritan in 1861, and was followed by the Hospital for the Ruptured and Crippled in New York in 1863.

There is now a concensus of qualified opinion that in all fields of orthopaedic work the most complete restoration of function in the shortest possible time and with the least suffering to the patient can most perfectly be attained by grouping these cases in special hospitals or departments of hospitals. Mechanical devices, physiotherapeutic methods, and the details of special operative technique require trained teams not found among general medical or surgical groups. We may, moreover, thus most surely create an atmosphere which induces that attitude of mind so necessary to the mental and physical recovery of the handicapped.

Brown, himself a cripple like Little, realized this truth, and was the first surgeon in America to devote his professional life to Orthopaedic Surgery. So from the little ward in the Hospital of the Good Samaritan spread this specialized hospital care which we all recognize today is both scientific and humanitarian.

To these spirits of the restoration of function in deformity and disease we owe the debt of continued endeavor.

I have reminded you of these colleagues of many lands not because you are ignorant of their stature, but because the truths for

which they lived and died do not change, and we can progress only by sensing these truths as the background of our work.

We venture, without authority, but with conviction, to sketch the foreground.

No one can read The Cameron Prize essay of Sir Robert Jones without being stirred by the opportunity which the widening scope of Orthopaedic Surgery presents. When the great conservative University of Edinburgh establishes a chair of Orthopaedic Surgery it is a recognition which imposes a sober responsibility upon the specialty.

It is perhaps not wise for us yet to lay down finally the lance of the Crusader, but at least we are not forced to struggle longer for a place in the sun. Orthopaedic Surgery, by the achievements of its dead and living exponents, has received its meed of recognition and praise from the Profession of Medicine, nor, by and large, has this recognition been grudgingly granted. It is rather for us today to seek a closer contact, to feel more keenly the stimulation of rivalry in the acquirement of anatomical and pathological knowledge and the attainment of skillful and gentle surgical technique and perfect asepsis.

We fully recognize that brilliant operative ability is not the only nor the main goal. Perhaps the major part of orthopaedic practice will in the future be concerned with the prevention of disease and deformity. But if we essay to be trusted with the knife, if we call ourselves surgeons, we must be so in very fact. We have often felt justified in criticising the work of general surgeons in bone and joint lesions. Our own work, therefore, must not be unfavorably compared with the best which General Surgery and the other surgical branches exhibit. If we do not measure up to these standards we in turn may be rightly criticised for attempting that for which we are untrained, no matter how brilliant may be our bloodless methods of functional restoration.

If we attempt only that for which our training has fitted us, and without reserve or embarassment admit our individual limitations, turning to those within our ranks or outside for the help which their fuller training can render, we shall enhance the respect in which we are held and serve our patients more honestly.

We would not be misunderstood. We plead for the most complete early training in general surgery of all those who would be-

come Orthopaedic Surgeons. We have very fortunately a rapidly increasing group of men who have been so trained, both within the Association and without.

We believe the day is near when it will be generally recognized that a new problem in the Surgery of the Extremities and Spinal Column is more likely to be solved by an orthopaedic surgeon than by any other. We believe it is already recognized that an orthopaedic surgeon, whose training is equal to that of a general surgeon of comparable ability, will probably obtain better results in the treatment of fresh, simple and compound fractures than his general surgical colleague.

Yet today some of us, among whom your President most definitely includes himself, must realize that in certain cases, havmade clear the principles which must underlie the restoration of function, we must be ready to delegate to others the carrying out of the details of the operative procedure necessary to the fulfillment of our purpose. We must do this or else patiently train ourselves to the accuracy of operative technique which the case requires.

This is but a temporary limitation, a passing phase in the growth of Orthopaedic Surgery, but we shall do well to recognize the phase.

In what fundamental science do we most need at the present time to train ourselves, if we would surely contribute our part to the advancement of medicine and surgery? We believe in physiology. We need sorely research workers. The field has rich soil, as is shown by the brilliant contributions to medical knowledge of certain of our members who have contrived to steal time from the confusion of clinical work and to spend quiet, fruitful hours in the experimental laboratory. We must follow farther the paths of Ollier and Macewen and Codivilla, and blaze trails beyond, bringing our clinical experience to bear upon the purely experimental investigations, seeking to interpret and better our results by knowledge of the fundamental physiologic processes, the laws of growth, and the minute mechanisms of repair.

We look forward with confident expectation to this development in the prevention of deformity and the restoration of function by exercise and bloodless methods; to a fuller appreciation of the value of rest in many diseases and many injuries; to a more com-

plete understanding of the mechanics of the human body and of the sound mechanical principles which must obtain in all the apparatus which we apply; to an increase in our knowledge of normal physiology and pathology; to the universal training of Orthopaedic Surgeons in surgical judgment and technique; to the recognition by great institutions and perhaps by our State and Federal governments that the segregated care of the handicapped under the direction of specially trained surgeons is not only a humanitarian measure, but of advantage to the body politic.

I thank you, gentlemen, for the honor you have done me in electing me your President.

DR. ARTHUR J. GILLETTE

Died March 23, 1921

BY DR. OSGOOD

It is my sad duty also to record the death on March 23, 1921, of Dr. Arthur J. Gillette, charter member of the American Orthopedic Association, its Second Vice President in 1892, member of the Membership Committee in 1893, and President in 1900; Professor of Orthopedic Surgery in the University of Minnesota, Surgeon in Chief to the Minnesota State Hospital for Crippled and Deformed Children, Orthopedic Surgeon to St. Joseph's, St. Luke's, St. Paul's, the Bethseda, and the City and County Hospitals of St. Paul.

To his energy and influence was due the establishment of the first state hospital in America for the care of crippled and deformed children. He remained until his death the inspiration of the model institution at Phalen Park. He was the pioneer orthopedic surgeon of the Northwest.

His domestic life was one of great happiness. He was a generous friend. The Association has lost a councillor who for many years helped to shape its policy, and by a full life devoted to the care of the cripple spread the gospel of the specialty.

DR. HARRY MITCHELL SHERMAN

Died May 15, 1921

BY DR. OSGOOD

On Sunday, May 15, 1921, Dr. Harry Mitchell Sherman, of San Francisco, died at the age of 67, from a cardiorenal complication of his old enemy, asthma.

Elected to the American Orthopaedic Association in 1889, he served as its Second Vice President in 1893, its First Vice President in 1896, and its President in 1899.

He was born in Providence, R. I. After receiving an A. B. from Trinity College and his M. D. from the College of Physicians and Surgeons, he became a member of the staff of the Bellevue Hospital and Assistant Surgeon at West Point Foundry, New York. Since 1886 he has been Orthopaedic Surgeon to the Children's Hospital and Surgeon to St. Luke's Hospital, and the University of California Hospital in San Francisco.

After many years of almost exclusive devotion to orthopaedic surgery, his work broadened into general surgery, and he was made a Fellow of the American Surgical Association.

He was the Nestor of Orthopaedic Surgery of the Pacific Coast. Of high scientific attainments, broad culture, great personal charm, and warmth of heart, he was the inspiration of younger men. Beloved by all who came in contact with him, unselfish in his devotion to his country, his profession, and his friends, his loss is widely felt, and with peculiar keenness.

FRACTURES OCCURING IN BONE GRAFTS.*

BY S. ALWYN SMITH, O. B. E., D. S. O., CH. M., F. R. C. S., EDIN.,
CARDIFF, WALES.

Fractures of grafts have occurred, I imagine, in the experience of most of us and I am bringing the subject before you so that we may discuss the causation, and determine if possible, as to whether the fault lies wholly, or in part with errors of operative procedure of after treatment, or of both.

Pre-war results of bone grafting in children and adolescents, and experimental work, largely on growing dogs, were so satisfactory that a too optimistic idea of the intensity of the osteogenetic power of the graft became prevalent.

I conclude that it is now generally accepted that an autogenous graft implanted into a bony gap, in the main, dies and is absorbed and replaced by osteoblasts derived to a certain extent from its own surface, but principally from the endosteum of the host bone at either end. This has been worked out experimentally by Gallie and Robertson and is to all intents and purposes the dictum propounded by Murphy, i. e., that a graft acts as a scaffold.

Given adequate coaptation and fixation between graft and host bone, circulation on the surface of the graft is apparently restored in a very few days after operation by means of granulation tissue and osteoblasts then proceed to absorb the base of the graft and to lay down new bone—this process beginning at each end of the graft in the region of the coapted surfaces.

As a rule, absorption outstrips restitution and as a consequence the graft becomes soft and porous at either end, particularly around each extremity of last bone. This occurs about the sixth week. If rigid immobilization of the part has not been carried out and stress or strain on the graft is allowed, the first and commonest type of graft fracture occurs, which we may call a "Disintegration Fracture."

This fracture generally happens six to eight weeks after operation and is more apt to occur if a graft of soft cancellous bone has been used. The use of ribs as grafts where any gap is

*Read at the meeting of the British Orthopaedic Association, London, Nov., 1920.

present is to court failure and for the same reason, slide inlays (where the bone is atrophic due to disuse) are not advisable if harder bone from elsewhere in the section is available.

Such a fracture may occur inside a well fitting plaster cast, if, on account of malposition of the bone fragments, the graft be put into position under stress. If strict immobilization continues after the fracture is discovered, union may occur, but if movement of the parts is permitted, disintegration of the graft goes on to an extent dependent on the porosity of the bone.

In a case of bone gap in the upper third of the ulna, that I operated on this year, it will be seen that on account of the deformity of the radius, there was a tendency to lateral bowing of the arm. At the operation I tried to keep this deformity in check as much as possible, although the graft had to be implanted somewhat obliquely to the long axis of the ulna.

The casts were carefully applied to prevent strain on the graft, but it bent at the upper end as soon as it became softened and a definite fissured fracture appeared at the maximum point of stress. At this stage there was a definite "give" in the graft on palpation. (Fortieth day.)

A further month in plaster enabled the graft to harden and now, eight months after operation, the fracture has united with a large amount of callus.

I may say that in these cases I fix the joints above and below the graft, but allow movement of the fingers from the beginning. The cast in this case gripped the wrist—like a short cock-up splint, to prevent pronation and supination. All protection was removed at the end of the fifteenth week.

The fracture then occurs above or at the end of the graft generally opposite or half an inch centrifugal to the extremity of the host bone.

When the fracture is complete, little further absorption appears to go on where the graft has a good matrix, such as one taken from the subcutaneous surface of the tibia. We have now a unilaterally fixed graft, which remains almost indefinitely devitalized, hard and sclerotic, while the site of fracture became a typical non union, the extremity of the graft becoming pegshaped. The portion of graft attached to the other end of the host bone, that is the sharp end appears to become reconstituted as this end

of the fracture becomes cup shaped. I show slides showing an old fractured graft of two years standing where the bone was found at reoperation to be hard and avascular with apparently no attempt at canalization although full function of the bone had been allowed for nearly two years. This point emphazises that where two bones are fractured after grafting such as radius or fibula, function of the limb is very different than function of the bone. Changes in bone follow Wolffs law only when function of the individual bone takes place. Another slide shows that the long end of a fractured graft of a years standing, when drilled, displayed no signs of circulation except for half an inch centrifugal to the extremity of the host bone.

Where a bone graft unites normally the graft remains hard and devitalised for a length of time proportionate to its length and width and original density, that is to say hard sclerous bone as from the crest of the tibia remains so longer than that from the subcutaneous surface which contains medulla. Conversely, as I have mentioned before, open mesh bone is prone to early fracture, but is reconstituted earlier. Should a graft survive the first three or four months without disintegration, we may regard the case as successful, although fractures after this time may occur. After this length of time, if the graft be given modified function restitution keeps pace with absorption, but the dual process slows down considerably and for a prolonged period the graft may depend almost entirely on its mineral constituents for its strength especially at its centre. The limb may appear strong but sudden strain or stress may produce the second type of graft fracture which, for want of a better name may be called "Clay Pipe Stem Fracture."

This generally occurs near the centre of the graft and is usually transverse, concave or convex, looking exactly like the broken ends of a Churchwarden pipe.

These fractures may occur several months after the bone grafting operation, especially where a hard cancellous graft has been used. Apparently, they will unite, but a prolonged period is required for a union to take place.

I show slides of two cases where this fracture occurred. The interesting point to note is that the graft in one is in the hip. A split spur of bone behaving as a graft, after having remained

dormant, so to speak, while there was no function, became osteogenetically active as soon as the limb was used; thus seeming to prove the infallibility of Wolff's law. In both instances I allowed modified function—that is locomotion in a calliper splint, one being a fracture of the femur and hip and the tibia. I inferred that stimulation of the fractured ends would increase the blood supply and consequently osteogenesis. To further this end each case was given percussion and damming as described by H. O. Thomas.

It has been shown experimentally by Gallie and Robertson, that boiled grafts will not stand the strain of bone gaps of more than three-quarters of an inch, although the physiological changes in such a graft are similar to those of autogenous grafts. I cannot see why suitable homogeneous grafts should not succeed and but a year ago, I decided to perform homogeneous grafting when the opportunity arose provided donor and recipient were sympathetic as regards their blood.

I was interested to see that Gallie mentions this point in his paper. I performed such an operation some weeks ago, but the short time that has elapsed is not sufficient to give you any data. The donor's blood was Group 4 and the recipient belonged to Group 2. The recipient was a case of ankylosis of the knee with a large ulcerating area on the heel that rest and various attempts at skin grafting had failed to cure. The recipient had a three-inch gap in the tibia. I used two big grafts—the homogeneous one I inlaid into the external surface of the tibia after retraction of the tibialis anticus muscle. I cut a good sized autogenous graft from the other tibia, which I inlaid into the subcutaneous surface of the tibia. The medullary aspect of each graft was in juxtaposition with the other. I thus hope to reconstruct a medullary cavity.

I think that disintegration of grafts is less common nowadays than formerly—it certainly is so in my experience and this I attribute to the present use of much thicker grafts than was formerly my custom, together with immobilization of the part for a longer period of time than was previously considered necessary. The thickness of the graft and its density prevents fracture during the time osteoporosis is going on, although final restitution and canalisation is so long a process that later fractures may occur when the bone is brittle and avascular.

Even after prolonged use, a successful graft remains distinct and the original site of nonunion appears sclerotic. I do not think that the question of operative fixation by means of metallic absorbable sutures or even where no sutures are used, has any bearing on the problem as long as adequate fixation and coaptation of surfaces is produced. Fractures have occurred with all methods. The question of coaptation is most important and it is necessary to have as much graft surface in contact with host endosteum as possible. This, by the way, is an important factor in skin grafting. The diagrams show how much more likely to succeed are abdominal flaps attached to the recipient arm area on three sides before the pedicle is cut, rather than long narrow "tip-over" flaps attached at each end.

The bone graft should be bulky and its consistency should vary with the length of the gap. The bigger the defect, the more compact should be the graft substance.

The cricket ball graft has one weak point—disintegration fracture is apt to occur at the junction between the wide and narrow portion as this is the slotting site. From the standpoint of technique, it is always easy to avoid weakening the junction by sawing into the neck of the graft, when making transverse saw cuts.

May I again labour the point of large coaptation surfaces and rigid immobilization in the early weeks after operation. These points are of supreme importance. I feel sure of obtaining uniform results and I fear that as rules of procedure, they have been too often observed in the breach with disheartening consequences.

Discussion

THE PRESIDENT: This is a very interesting paper, and I know quite well that many men here have had a large experience of bone grafting, and a number of interesting questions have been raised, especially questions of scaffolding, absorption and fracture. I will ask Mr. Hey Groves to speak, as he did a great work in the war, and has taken bone grafting to a stage which is as near perfect as may be.

MR. HEY GROVES: Many interesting points have been raised in Mr. Alwyn Smith's paper, so that it is a difficult matter to confine one's remarks to a reasonable length.

First one or two words in criticism of his statements about the history and theory of bone-grafting. I do not think Murphy should be credited with being the first to initiate the idea of the bone graft as a scaffolding: it was originally the theory of Barth. His original drawings and sections demonstrate as clearly,

almost, as Gallie and Robertson in recent years, the process of vascularization of the dead bone. After Barth, all the painstaking work of Axhausen and others tended to reverse the opinion, and to show that the autogenous graft really took some active share in the regeneration of bone. Therefore I venture to protest a little against the assertion of Mr. Alwyn Smith, which seemed, rather, to imply that the graft only acted as a scaffolding, and died.

The subject is one of extreme complexity, and it will be many years before it is absolutely settled. It seems to me that many observations are necessary. What happens is, that in favourable cases an autogenous graft will take a very active share in the regeneration of bone. In unfavorable cases it will take no share, and the mere multiplying of instances where this latter occurs does not prove the point. It seems to me we should still take autogenous grafts in all circumstances where these are favourable.

In taking part in a debate in Canada last year with Gallie and Robertson school adherents, I put this to them: If, as they state, a patient is equally good with an autogenous graft, why do they consider themselves justified in taking a piece from the patient's own tibia? Obviously they do not believe what they themselves say, otherwise it would be easy to have pieces of bone ready to hand and they need not use the patient's own tibia.

The practical points raised by Mr. Alwyn Smith I am in agreement with. He has emphasised the great importance of using the grafts as large as the bone which they have to replace, if possible, because a certain stage of osteoporosis is gone through, during which the graft is very liable to fail.

With regard to the cricket-bail graft, his view is correct, and for some time now I have abandoned the simple way of putting in these grafts, i. e., putting one end in the fragment of the host bone, and levering out the end of the graft and slipping them together. It is a most attractive operation to do, and it is the best one to demonstrate to others; and, at the moment, it seems as near perfect as you can have it. But in a considerable number of cases, in my own practice and in the practice of those I have been associated with, there is a great strain on the point where the thick and thin portions of the cricket-bail graft join, and there is liable to be a fracture there. Therefore it is better to use the more difficult technique, driving one end of the graft into one host bone, leaving the other end much thicker, and tapering more, splitting the upper end of the host bone, and so putting it in, and surrounding the upper end of the host bone with some form of ligature.

Mr. P. J. Verrall: I was very interested in the remarks with regard to the humerus. I should say it is a part of the body in which you are especially apt to get trouble in regard to the graft. Recently I have had three successive cases sent on to me in which fracture has occurred in the graft. Two of them had very strongly positive Wassermann reactions; I think that is most important. I would like to have some information in regard to the Wasserman test in all the cases which have been recorded. In the case of the humerus I have given up using any form of lateral inlay graft at all. There are, I think, only two ways of doing the humerus; either to get the two ends absolutely square and in contact—in which case one fixes them with a double intra-medullary peg; or where there is a gap I have adopted one course only, namely, a double intra-medullary fibula; then there is a continuous medulla from end to end. I have done four cases now, and all with success. I have two coming tomorrow to show you. The fibula thickens up. I ask for guidance as to the subsequent treatment of fibula grafts, that is, as to when one should trust the bone. I have let them go with abduction plaster for three or four months, and then put on a plaster allowing movement, at the shoulder, not at the elbow. It is rather pioneer, in a way, to know when one should let free use of the arm thicken the bone.

(In answer to Mr. Hey Groves): By a double intramedullary graft I mean one graft, intramedullary at both ends.

MISS FORRESTER-BROWN: The upper end of the ulna seems particularly difficult to get to unite, and I think that must have some relation to the position of the nutrient artery. Unless there is much overlapping of your graft on the ulna, there is apt to be a false joint at the upper end. The lower end of the humerus seems somewhat the same. In Mr. Alwyn Smith's case there was displacement of the upper fragment of the tibia. Even in the case of an intramedullary graft the upper fragment seems to deviate towards the radius and it forms an angle with the graft.

MR. A. H. TUBBY: Some of the most difficult cases of bone-grafting we have had to deal with, have been those of gunshot fracture of the jaw, followed by an un-united fracture. The difficulty in securing a good result here after bone-grafting, is due to septic infection arising from contact with the secretions of the mouth at the site of the operation. Before the operation, the wound of the oral mucous membrane must have healed, and during the operation you must take great care not to penetrate into the mouth. I think you will find the jaw shows a ready tendency towards union after bone-grafting, if these precautions are observed. After a gunshot wound of the lower jaw in a young soldier there was non-union and a gap of one inch. It was necessary to graft bone. In exposing and refreshing the ends of the fragments, minute care was taken not to wound the mucous membrane covering the gums and bone. Being satisfied on this point, a graft was taken from the tibia and placed in position. Firm bony union occurred in four weeks, and the man went home in a satisfactory state. With the precautions, which have been referred to, bone-grafting in these cases, should not be regarded with so much apprehension as it has hitherto been.

MR. HEY GROVES: Miss Brown spoke about the ulna, and I think her point was an important one. May I suggest a valuable technique in dealing with the ulna? It is to bore the proximal end of the ulna, and then the distal end, then cut a peg from the tibia, roughly shaped to be about ⅜-inch thick, and this is driven down like a nail, the proximal end of the ulnar fragment being exposed by splitting the triceps tendon, and the graft being nailed down. This gives extraordinarily firm fixation to both the proximal and distal fragments, and I think it is a decided advance over any other method.

MR. ALWYN SMITH (in reply): I think the question of blood supply in these cases is very important, and I always understood that the results of bone-grafting of the jaw were universally satisfactory on account of the fine blood supply there is to the part. And I always regard the junction of the lower and middle thirds of the tibia as a danger spot, because there the circulation is apt to be poor and as a consequence there may be a paucity of osteoblasts. The ulna at about the junction of the upper quarter and the middle half has been the point I have had trouble with. At a point three or four inches below the elbow joint, where you can get the upper end into the bleeding cancellous part of the olecranon, I have had very good results. Where there is displacement in the bones, such as I showed in the case of the ulna, where the radius had united after a long time, but with bowing, there I do not think it is well to put in a graft under stress so the graft is really not ossially correct. I put my graft in so that it lies parallel to the long axis of the bone. I use simple soft iron wire, which one can get from the ironmonger very cheaply. You can make sure at the end that you have absolute co-aptation of the surfaces. I have had very little trouble with my non-absorbable suture material, and I do not want to go back to pegging them in or using catgut or kangaroo tendon. I like to see that it is a mechanical as well as a surgical job by the time I have finished. Seeing that the graft is well and truly fixed in has much to do with getting the circulation well established.

THE POSSIBILITIES OF SUTURE AFTER EXTENSIVE NERVE INJURY*

BY MAUD FORRESTER BROWN, M. D., B. S BANGOUR.

If you find me going over ground which is familiar to all of you, you must excuse me, but I have been led to select this subject by finding few references to it in a large amount of recent literature on the subject of Peripheral nerve injuries. Moreover, I was struck by the number of cases reported, in which the surgeon had regarded gaps of 2″ or 3″ in the nerve as hopeless for suture and had resorted to nerve-grafting.

At Bangour nearly all the nerve graft operations were done in the early days of our experience and it seems likely that a big proportion of them could have been sutured with our present technique.

Out of 500 consecutive cases operated on between 1916 and 1918, suture was not able to be carried out in 31 (6.2%). Of these 7 involved the Musculo-spiral and 3 the External Popliteal and these were subsequently treated by tendon-transplantation. Another 10 were abandoned without attempt to bridge the gap. 11 were treated as nerve-grafts and of these only 3 have shown any definite evidence of recovery, which was not complete when they were last examined.

As all observers seem now agreed that the prognosis is bad after nerve-grafts, it is most important to get end-to-end suture of the nerve if possible. I propose, therefore to run over quickly the methods at our disposal for relaxing the nerve so as to get apposition of the cut ends, and then I will tell you what our experience at Bangour has been as to the possibilities with the various nerves.

The methods available then are in number namely:

1. Extensive *freeing* of the nerve from its bed.
2. Relaxing it by fixing *joints* in suitable positions.
3. *Altering the course* of the nerve.
4. *Stripping* up any *branches* which anchor it.

*Read at the meeting of the British Orthopaedic Association at Edinburgh, June 4th, 1920.

5. *Sacrificing branches.* (Compensating for Motor branches by tendon-transplants.)

6. Shortening *bones.*

7. Stretching the nerve in *two stages* by two successive operations.

1. The first step is then to *free the nerve* from its fascial connections, so as to take advantage of its inherent elasticity. The greater the length we free the greater is the gain. There is probably a limit, which is constant for each nerve, though it may vary with the individual patient. The elasticity is much reduced by sepsis which had spread up the sheath or nerve bundles. By this method in the *Median* or *Ulnar* in *Arm* we can gain 1½"; in the forearm 1"; in the *Sciatic* in *Thigh* 2".

2. The next method is to relax the nerve by *fixing* the *joints* in suitable positions. As the main nerves of a limb pass across one or more joints and are of such length normally that they are barely taut in the position of maximum strain, it follows that considerable gaps in a nerve can be dealt with by fixing the joint for a time in the position which relaxes the nerve, and gradually stretching it later. To take full advantage of this manoeuvre, it is necessary to *free* the nerve *extensively* first; otherwise its fascial connections compel it to follow the curves of the limb instead of stretching like a bow-string across the concavity of the joint. It might be feared that this device would *permanently limit* the *range* of the joint, a serious complication; but experience shows that such tense nerves *yield well* to gentle and gradual stretching. For fear of rupture at the suture line, it has been our custom not to begin any stretching for *six weeks* from the date of operation. I have not met a case in which the full range was not obtained; usually this is within 2 months, but occasionally 3 to 6 months are required to fully stretch the nerve. As no considerable degree of recovery can be expected under that period, and as massage is advisable in any case, the joint condition does not represent a serious disability.

Adduction of the *arm* at the shoulder gives about 1" (beyond. that gained by freeing) to the Median, Ulnar, Musculo-spiral and Musculo-cutaneous.

Flexion of the *elbow* gives about 2" to the Median and 1" to the Musculo-spiral, as the latter courses to the back of the forearm immediately after crossing the elbow.

Extension of the *elbow* relaxes the Ulnar, giving about 1″. The Median and Ulnar are therefore antagonistic to one another. Fortunately it is easy to bring the Ulnar to the front of the elbow and so relax it with the Median.

Flexion of the *wrist* gives about 1½″ to the Median and Ulnar in the forearm.

Flexion of the *knee* gives about 2″ to Sciatic, or Popliteals, in addition to the 2″ gained by freeing alone.

3. *Alteration* of the *course* of a nerve.

I have referred above to the possibility of altering the course of the Ulnar so as to gain the advantage of flexion of the elbow which relaxes the nerve 2″ to 3″ compared to the 1″ gained by *extending* it with the nerve in its normal bed. The *Ulnar* is the nerve which gains most by an alteration of its course, as its normal one is so *devious* from the front of the arm to the back of the Int. condyle and then forward again to the front of the forearm. The nearer the mid line it is brought, the shorter is its course; it is hindered from reaching the mid line by the *branches* to Flex. Carpi Ulnaris and Profundus, which arise from it behind the condyle and enter the muscles after a short course; they can however be freed up from the main nerve for some distance and then allow it to be displaced further.

Another nerve which sometimes benefits by *transposition* to the front of the limb is the *Musculo-spiral.* Lesions of this nerve are often complicated by fracture of the humerus, and if the bone has united with *backward bowing* and *excess* of *callus* behind, the course of the nerve may be shortened 1″ or more by bringing it to the front of the humerus between the Biceps and Brachialis Anticus. As the upper end of the Musculo-spiral is best found in extensive lesions, by an *incision in the axilla* along the inner border of the Biceps, transposition only entails lengthening this incision.

The only other nerves whose courses we have attempted to alter are the *Median* and *Posterior Tibial,* by bringing the former superficial to the *Pronator Radii Teres,* and the latter superficial to the *Soleus,* so as to gain the full benefit of flexion of the corresponding joints, instead of letting the nerve be held at an angle by the muscle.

4. *Stripping-up* of *branches.*

After the 3 methods referred to so far have been tried, it often happens that a gap still remains between the nerve ends, which are *anchored by* the origin of *branches,* while there is obvious *slack* in the nerve *beyond* these branches. We have therefore at Bangour resorted to very extensive stripping up of branches from the main nerve in difficult cases and thus have got apposition of nerve-ends which at first seemed hopelessly separated. We have found that this procedure does *not impair the function* of the branches except for a few days.

The maximum gain is obtained when the *branches* arise *above the lesion,* so that the part of the nerve from which they originally arose can be pulled down to the level of their entrance into the muscles and even far beyond this so that they run an *inverted course.*

There are *certain groups* of nerve branches to which this treatment is specially applicable, in that they run an independent course within the main nerve sheath for a considerable distance, and therefore their apparent origin from the nerve is not their real one. Such are:

a. The *Triceps* branches of the MUSCULO-SPIRAL, which appearing to come off singly in the Musculo-spiral groove, can be traced to one leash which can be stripped from the main nerve as high as the apex of the axilla.

b. The *Motor* branches of the *Median* for all the forearm muscles come off in one leash under cover of the Pronator Radii Teres and divide into two sets, one to the superficial flexors, the other to the deep flexors including the Anterior Interosseus; the whole leash can be stripped from the Median to 1″ above the elbow while the branches to the Pronator which arise above them can be stripped even higher.

c. On the *Ulnar,* the branches to the *Flex. Carpi Uln.* and *Profundus,* as already mentioned can be stripped to above the elbow.

d. The *Hamstring nerve* sometimes arises independently of the SCIATIC, but often leaves the main nerve as a series of branches all down the thigh; yet it can always be freed up to the notch.

e. The branches to the *Gastrocnemii* from the Int. Popliteal can be freed to the upper end of Popliteal space.

f. *All* the branches of the *Posterior Tibial* can be stripped up for considerable distances.

The two nerves which do *not* lend themselves to this treatment are the *External Popliteal* and *Posterior Interosseus,* for they divide near their origin into several branches of nearly equal size, which are usually all involved in the lesion.

I will give you short reports of two cases to illustrate the fact that such extensive disturbance of branches need not paralyse them and that the extreme tension on the nerve does not prevent recovery.

1. Cpl. Dalby G. S. W. R. forearm 31=8=18. Healed October 1918.

Cond. 11=3=19 Median anaesthesia and paralysis of small muscles. Tendons adherent. Partial Ulnar anaesthesia and weakness of small muscles.

Op. 12=3=19 Suture of Median in forearm—4″ gap. wh. overcome by mobolising Pronator and freeing nerve fr. lower one-third of arm to wrist and pulling proximal end down till its leash of motor branches were inverted, joints flexed. Ulnar freed and tendons; Flex. c. Rad. sutured in spite of loss of its mid ⅓.

Sixth week—Progress 6=9=19 thenar hyperalgesia. 21=9=19 pressure now felt on Median area. 11=10=19 prick and wool felt exc. for small patches. Abd. Poll. responds to Faradism.

Nine weeks after operation—21=12=19 Thenar muscles act well. Only disability adhesions of flexors of index. Hand otherwise very good.

2. Pte. Owens bullet wd. L. forearm, fractured Ulna 14=7=18. Healed 25=2=19.

Cond. February 1919 Ulnar anaesthesia and paralysis. Knuckles stiff to flexion. Extension of elbow and wrist limited.

Op. 29=3=19 suture of Ulnar after transposition into groove in flexors. 3¾″ gap. Ulnar freed fr. wrist to lower ⅓ arm; branches to Flex. C. Ulnar and Profundus freed to allow nerve to reach front of elbow; course inverted. Elbow and wrist acutely flexed. Inner 2 Prof. tendons wh. cut, sutured to rest of profundus. Faradic response obtained in Flex. C. Uln., branch arising above the lesion.

Eight weeks—Progress 20=5=19 Flex. C. Uln. acting well; inner profundus weak. 6=6=19 Hypothenar tenderness; joint sense returned in 2 prox. jts. of little finger. 4=1=19 wrist str. with elbow at rt. angle. 24=7=19 wrist can be dorsifiexed. 22=8=19 pressure felt in little finger. 4=9=19 prick and wool felt on some parts. Abductor Min. Dig. just contracts.

Six and one-half weeks—3=10=19 wrist free and elbow as much as before op. 9=10=19 transplant of Palm. Long. to Ext. Commun. 2=11=19 sensation completely returned. Abd. Min. Dig. gd.

Ten and one-half weeks—4=2=20 Interossei begin to act.

5. If we still fail to get apposition after the devices referred to already, we must consider the advisability of *sacrificing branches.*

I mentioned before that the stripping up of branches only gives much relaxation of the nerve if the branches arise above the lesion; those *below* it have a fixed insertion and soon become tense themselves. We must remember that these are *already paralysed* and therefore suffer nothing in the attempt to suture another part of the nerve by dividing them.

Branches above the lesion should be sacrificed, if the function of the rest of the nerve surpasses theirs in *importance.* Thus the *Ulnar* motor and sensory supply *to the hand* is far more valuable than that to the Flexor Carpi Ulnaris, or even the inner 2 Profundus tendons, which can moreover be got to function by suturing them *to the outer two,* which are innervated by the Median.

Sir Harold Stiles pointed out to us that the *sensory* portion of the *Median* far *surpasses* in importance its whole Motor portion, since if the thumb and index finger remain anaesthetic, the patient does not use them, even when the muscles are acting. If only the Median muscles are paralysed, the *Ulnar muscles* give the digits quite *useful function,* which can moreover be supplemented by tendon-transplants.

It is only necessary to *sacrifice* the *Median* motor branches in the forearm for gaps of *more than 4".* In this way a *6½" gap* has been overcome. It must be remembered too, that such extensive lesions of the nerve are almost invariably accompanied by

destruction of some of these *branches,* or of the *muscles* that they should supply.

6. One other method of relaxing a nerve remains after these mentioned have been used, namely to SHORTEN THE BONES of the limb.

We have found this very useful where an *ununited fracture* was already present. This is most commonly a fracture of the *humerus* associated with a *Musculo-spiral* lesion. In such cases it is easy to expose the nerve-ends, note the amount of relaxation required, and then unite the bone by *stepping it* with the requisite shortening.

In the forearm where an *ununited radius* complicates the nerve injury and where there is extensive scarring, a good result is attained by *shortening* the *Ulna,* suturing the nerve, and later grafting the Radius, as illustrated by the following case.

Pte. Ness G. S. W. L. fractured Radius 22=8=17. Healed 23=3=18. Ununited Radius; pronation deformity; contracture of elbow, wrist, thumb. Flexor tendons adherent; fingers stiff and straight. Median divided. Trophic changes marked.

First Op. 29=3=18 1½″ removed from Ulna subperiosteally; intramedullary peg. Plaster in pronation; changed to supination in 7 weeks. 13=5=18.

Second Op. 15=7=18 Median sutured in mid forearm after resection of neuroma, 1″ gap, nerve slack, though muscles already shortened up, wrist put straight. 4=9=19 Tingling 2″ below suture; thenar tenderness; trophic improvement.

Third Op. 19=9=19 Radius freshened, ends drilled and tied with kangaroo tendon; sliding graft, small.

Aug. 1919 Sensation quite returned; Opponens acting; fingers flex well; Radius united.

We have *hesitated* to divide *both bones* of the forearm where these were undamaged or already united, because there is always the risk of a *flare-up* of the initial infection, which might cause *non-union,* while any *excess of callus* would limit *rotation* of the forearm. Double forearm fractures are notoriously difficult to control, and any failure converts an already serious disability into a *disaster.*

7. When all the methods we have already discussed fail, there is still one way which may enable us to attain end-to-end

suture ultimately, namely a *two-stage* operation. In the *first* stage, the *untrimmed* nerve ends are *anchored* together with strong thread while the joints are flexed. *Extension* of the joints is begun *early* before the nerve has time to form adhesions, and as soon as it is fully stretched, it is *explored again*, the joints are again flexed and the relaxation so obtained usually allows for suture *after resection* of the neuromata. This is an operation which can be recommended when *sepsis* is unexpectedly encountered during a nerve exploration. The following cases illustrate its application:

1. Pte. Herdman G. S. W. L. fractured Ulna 10=8=18. 30=1=19 unhealed; Ulna ununited; Ulnar completely divided.

30=1=19 first operation, unhealed scar excised; adherent bone excised; Ulnar neuroma anchored to distal end without opening up healthy tissues but with wrist flexed.

24=2=19 thread came away, but nerve held.

2=4=19 healed.

4=8=19 second operation, Ulnar sutured after resection of 1½", freed up forearm; wrist flexed and elbow kept straight.

21=7=19 sensation to deep pressure returned.

4=6=19 joints free.

31=1=20 sensation returned on ring finger and prick felt on palm. Abd. M. D. acts Ulna ununited but no disability from it. Hand useful. The total gap in this case is equivalent to 3", the limit which can be dealt with without transformation.

2. Pte. McKenzie. G. S. W. R. fractured humerus 24=10=18.

25=10=18 Musculo-spiral sutured with catgut at C. C. S. (Post. wd. sutured). Healed 28=2=19, after which heavy massage given.

First operation 2=4=19 Musculo-spiral neuroma anchored to distal end with catgut (¾" overlap). Nerve destroyed in whole groove (about 3"). Neuroma lay with sequestrum in abscess in humerus. Nerve transposed and elbow flexed to 90°. Progress 21=4=19 pus burst through old posterior scar. 4=7=19 firmly healed. More heavy massage.

Four weeks 26=8=19 elbow range 90° to 160° (limited by arthritis as before operation).

Second operation 6=10=19 Musculo-spiral sutured with arm adducted to 45°. 1″ gap after trimming till good fibres reached. Distal end was indurated and inelastic. Primary healing.

16=1=20 tenderness of carpal extensors. Tingling to middle of forearm.

Six weeks 16=4=20 full abduction of arm. Ext. Carpi Rad. acting.

3. Pte. Martin. G. S. W. R. axilla 27=8=18. Oct. 1918 Brachial doubly ligatured for false aneurysm. Healed Nov. 1918.

Cond. Jan. 1920, complete Median paralysis and anaesthesia. Partial Ulnar ditto. Much stiffness, atrophy and trophic changes.

First operation 26=1=20 ends of Median anchored together without trimming. 4″ gap. Proximal end had 2″ neuroma; distal end ran in scar down to elbow. Elbow at 90°, arm to side of chest. Ulnar freed throughout arm.

Two weeks 9=2=20 stretching begun. Arm abducts to 60°.

29=2=20 arm to 90°; elbow to 100°.

Two and one-half weeks 1=4=20 full range of joints.

Second operation 8=4=20 Median sutured after trimming 1¾″ which left vascular fibres though swollen in proximal end and degenerate in distal one, wh. inelastic. Prox. end not normal to apex of axilla. Arm adducted; elbow to 80°. Primary healing. Though thread of first operation found surrounded by pus which was negative on culture.

To sum up:

The gaps in peripheral nerves which allow of end-to-end suture.

ARM	MEDIAN	ULNAR	MUSCULO-SPIRAL
By Freeing widely	1½″	1½″	1″
Adduction at shoulder	1″	1″	1″
Elbow flexion	2″	Extension 1″	1″
Transposition and elbow flexion	.....	1½″ more	½-1″
TOTAL	4½″	5″	3½-4″

FOREARM	MEDIAN	ULNAR	Remarks
Freeing widely	1″	1″	Less than in arm
Elbow	Flexion 1½″	Extension 1″	as so many
Wrist, flexion	1″	1″	branches
Inverting branches	1″	1½″	fix them.
Transposition and elbow flexion		2″ more	Median has more branches than
TOTAL	4½″	5½″	Ulnar
SACRIFICING BRANCHES	2″ more	1″ more	
TOTAL	6½″	6½″	

TWO-STAGE OPERATION (anchoring neuromata) gives 2″-3″ more in the end.

SCIATIC (any level from notch to knee)

Extensive Freeing	2″
Flexion of knee	2″
TOTAL	4″

POSTERIOR TIBIAL below middle of leg i. e. below main branches:

Freeing (including Sciatic)	1 ″
Knee flexion	2 ″
Inverting branches	2½″
Ankle plantar-flexion	½″
TOTAL	6 ″

N. B. With more extensive destruction of the nerve than can be dealt with by the above methods there is almost sure to be such wide spread injury to other soft parts, if not to the bone, as to render the limb of little value, even if the nerve were to recover, so that its involvement becomes of minor consideration.

After all these devices have been resorted to, we shall still encounter a few cases in which end-to-end suture is impossible. Fortunately the *Motor* function of most of the nerves of the upper limb can be substituted by *tendon transplants.* Indeed that for Musculo-spiral paralysis gives an almost normal hand within a few months, and this nerve is the one most likely to prove inoperable.

Loss of all the Sciatic muscles does not always give a great disability.

If either the *Ulnar or Median* muscles are functioning, they *substitute* so well for each other that the patient may not greatly miss the one.

It is the *Sensory function* of the Median and the *Trophic* function of both Median and Internal Popliteal that represent such a serious loss, and therefore *nerve-grafting* is worth trying as a last resort, for it can do no harm. Out of the *11 cases* operated upon in this hospital, most have shown the signs of commencing nerve regeneration and *two* have definite Motor and Sensory return, though incomplete when last seen.

Discussion

Mr. Platt: I have listened with great interest to Miss Forrester-Brown's paper, but I am not quite convinced that her recoveries are quite genuine. I believe that everybody will be tricked some time or other, in fact, after six years examining nerve injuries, I have come to the conclusion that most people are unable to tell whether a nerve has recovered without cutting down and stimulating. It is an exceedingly difficult thing to be sure of recovery in some of these nerve injuries, and the more one sees of these cases the less sure one becomes. I believe the only proof in these cases is to re-explore and see what happens when stimulation is applied.

With regard to the general question of closing these enormous gaps, personally, since I have been making a wide exposure of nerve at operations, I have not met with a case since 1917, where I was not able to close completely, and that I believe to be the experience of most men. In this connection I agree with Miss Forrester-Brown that it is justifiable to sacrifice the proximal supply.

I am sorry if I have appeared to be skeptical about Miss Forrester-Brown's two cases.

MR. LEAMING EVANS: I transplanted an external popliteal from an amputated leg, two years ago, and there were certain appearances of a recovery, but they were fakes. I was influenced to cut down and look at the transplant, and this I did, and I could not find the median nerve, I could not find the transplant: it had apparently absorbed.

MR. BANKART: In my opinion, if a man can do what he wants to do, it does not matter whether it is a trick or not. It is a matter of re-education, and the question is whether the same result can be obtained by re-education as by ransplants.

*MURRAY S. DANFORTH: Dr. Forrester Brown has given a very valuable and helpful paper based on a great amount of work, well done and well studied. It will be of great assistance to the surgeon doing nerve repair work to know approximately how much can be resected and still allow of end to end suture, for grafting to fill a gap has not been shown to give much hope of recovery.

Dr. Forrester Brown's paper is of further practical value for it not only states how much of a gap can be filled but outlines very clearly the methods to be employed. One method which is called to our attention and may prove of considerable help is the stripping up of the branches to allow of greater mobility of the nerve. That this stripping up is mechanically possible is well known but Dr. Forrester Brown's analysis of the cases in which this was done shows that the physiological continuity of the nerve is not destroyed or even impaired more than temporarily. The suggestions as to the possibility of destruction even of motor branches where by so doing nerve repair can be made which will restore sensation are also worthy of attention, as one makes use of this method only where the motor function is of far less value than the sensory function, or where the motor function can be restored by tendon transplantation.

It is by such careful analyses of cases, well done and well studied, that it is possible to actually advance the knowledge of nerve repair, and the series of cases reported adds to the sum of our knowledge.

*Written by Dr. Danforth in the U. S. as comments upon the above paper.

Editorial

THE AMERICAN ORTHOPEDIC ASSOCIATION

Boston Meeting, June 2-6, 1921

The 1921 Meeting of the American Orthopedic Association was the largest and in many respects the most important in the history of the Association. Sir Robert Jones and Professor Putti were both so good as to say that it was the best Orthopaedic Meeting they had ever attended. So much of the merit of the meeting and so much of the pleasure of the members and guests were due to the efforts of Dr. and Mrs. Osgood, and the members of the Boston Committees, that the Editor takes pleasure in submitting the entire list herewith:

President—Dr. Robert B. Osgood.

Programme Committee—Dr. William E. Gallie, Dr. James W. Sever, Dr. Lloyd T. Brown.

Local Committees—Dr. Robert W. Lovett, Chairman, Committee of Arrangements.

Ladies' Committee—Mrs. R. B. Osgood, Mrs. Robert Soutter, Mrs. Z. B. Adams, Mrs. J. W. Sever, Mrs. M. H. Rogers, Mrs. L. T. Brown, Mrs. L. T. Swain.

Press Committee—Dr. E. H. Bradford, Dr. Frank R. Ober.

Printing—Dr. Charles F. Painter, Dr. Mark H. Rogers.

Meeting Places—Dr. Robert Soutter, Dr. Frank R. Ober.

Trains and Train Reservations—Dr. E. G. Brackett, Dr. Henry Fitzsimmons, Dr. Andrew MacAusland, Dr. Marius N. Smith-Petersen.

Hotels and Housing—Dr. Joel E. Goldthwait, Dr. Loring T. Swaim, Dr. John Morton.

Automobiles and Transportation—Dr. Z. B. Adams, Dr. L. A. O. Goddu, Dr. P. D. Wilson.

Luncheons and Dinner—Dr. Augustus Thorndike, Dr. John Dane.

Acknowledgement must at once be made of our debt to our foreign guests, Sir Robert Jones, Professor Jacques Calve, Professor Vittorio Putti, and Mr. Harry Platt. They not only attended and added interest to all of our sessions but contributed formal papers of the greatest interest and scientific value. Sir Robert Jones influenced the entire meeting by his great knowledge of orthopaedic surgery and inspired every member and guest by his extraordinary energy and enthusiasm. Professor Calve described several new and interesting diagnostic and surgical procedures in scoliotic and tuberculous spine conditions. For our convenience he presented his contributions in English.

Professor Putti because of the highly scientific character of his papers on knee joint surgery and by his charming personality quite won the entire Association. Mr. Platt's paper on peripheral nerve surgery was also one of the most important papers read at the meeting.

At the sessions, which were held in the Boston Medical Library, it was not unusual to have more than 200 (an unprecedented number) in attendance. Unusual interest was manifested in the address of the President—historical in character—and in the paper by Dr. Allison on "The Teaching of Orthopaedic Surgery."

One of the interesting conclusions of the meeting was the general feeling as to the value of the "Commission" studies and reports. Previous commission activities on infantile paralysis and scoliosis had already produced interesting and instructive results. At this meeting the reports of the "Congenital Hip Commission" by Drs. Goldthwait, Z. B. Adams and DeForrest Willard, the "Commission on Ankylosing operations on the spine" by Drs. Brackett, Rugh and Baer and the "Commission on Foot Stabilizing operations in infantile paralysis," by Drs. Cook and Stern were received with the closest attention and unmistakable approbation. It was distinctly the feeling of those who heard the reports that the Commission Study of these problems was leading us to more definite ideas as to the value of methods in vogue and to standardization of the best surgical and other therapeutic procedures.

Dr. Ridlon's paper on the treatment of "Congenital dislocation of the Hip" will stand as one of the valuable documents of the Association and in fact of the history of the subject.

Other papers which attracted attention were those of Dr.

Lovett and Dr. Gill on "Infantile Paralysis," Dr. Bennett on "Quadriceps tendon lengthening," Dr. Starr on "Tendon Surgery in Military Hospitals," Dr. Steindler on "Arm and Shoulder Disabilities," Dr. Hoke on "The Stabilization of paralytic feet;" and Drs. Gallie and LeMeseurier on "Free fascia transplants." Saturday afternoon was spent at the interesting school for cripples at Canton.

At the dinner on Friday evening the members and guests were not only delightfully entertained but edified and instructed as well. At Dr. Osgood's request Dr. Bradford introduced the speakers. Sir Robert Jones spoke in the warmest terms of his friendship for American orthopaedic surgeons and of his enjoyment of the meeting. Professor Putti, Professor Calve and Mr. Platt spoke in similar vein.

Dr. Wilfred Grenfell, with lantern slides, told the members of his interesting and helpful work in Labrador. Dr. Grenfell was a frequent visitor at the formal sessions also. Mr. Adair of Atlanta and Mr. Kendrick of Philadelphia outlined the work so far and the plans of the Nobles of the Mystic Shrine for the care of crippled children. Their remarks were received with much enthusiasm. Dr. Allison, president elect, and Dr. Osgood the retiring president were the concluding speakers.

Following the three day session June 2-4, the members of the Association were given a delightful holiday on Sunday, June 5th as guests of Dr. and Mrs. Osgood at Ipswich. A clam and lobster dinner was served on the beach near Dr. Osgood's summer cottage, in the lovely estate of Mr. Crane of Chicago. Delightful weather made it possible for all members of the Association and the ladies to enjoy fully an occasion which will always be a cherished memory.

On Monday the Clinical Day was marked by Diagnostic clinics and operations upon the cadaver by Sir Robert Jones, Professor Putti, and Professor Calve. Dr. Smith Peterson showed the technique of his method for arthrodesing the sacro iliac joint. Dr. Osgood's dissections of the painful elbow bursa were shown and cured cases reported. Dr. W. R. MacAusland showed a convincing film of the operation and cases—of his method of elbow arthroplasty. Dr. Lovett presented a most interesting series of x-ray studies of bone conditions. These had been diagnosed by conclusive laboratory methods as syphilis, tuberculosis, osteomyelitis and sarcoma.

It was found that they did not at all conform to existing conventional ideas as to the possibility of arriving at a diagnosis by x-ray. Dr. Legg presented further studies and later views as to Legg-Calve disease. Professor M. J. Rosenau discussed bovine tuberculosis.

All of the matters above referred to and others will, in due course be published in further detail in our Journal. The meeting was one which it was a privilege to have attended and certainly a matter for regret to have missed. Orthopaedic Surgery and those who attended the meeting are better for it. As decided by a final vote at Boston—many thanks to those who made it possible.

Dr. Nathaniel Allison of St. Louis is president for the coming year. New officers elected were, Dr. Ralph R. Fitch of Rochester, New York, president elect. Dr. W. S. Baer, Baltimore, Vice president, and Dr. DeForest Willard, Philadelphia, Secretary.

AMERICAN MEDICAL ASSOCIATION, ORTHOPAEDIC SECTION

Boston, June 7-10, 1921

The Orthopaedic section of the American Medical Association was more largely attended than at any previous meeting. Dr. M. S. Henderson of Rochester, Minnesota, was chairman, and Dr. H. B. Thomas of Chicago, secretary. An excellent program had been arranged. Only a few of those who were listed to read papers failed to appear. The foreign guests of the American Orthopaedic Association remained for this meeting also. They attended the sessions faithfully and contributed greatly to the discussions. Sir Robert Jones especially contributed many valuable points from his experience to the discussion on Fracture of the Neck of the Femur; Elbow Injuries, et cetera.

The meetings took place in Paul Revere Hall, Mechanics Building, which was commodious and conveniently located. Unfortunately it was poorly ventilated and at times rather noisy. Notwithstanding these handicaps, there was an attendance of from one hundred to two hundred and fifty at the various sessions. The registration for the section was above one hundred and fifty.

For his chairman's address, Doctor Henderson gave a summary of and his conclusions from the bone graft work done at the Mayo Clinic. 413 cases had been studied and final results were reported. Doctor Henderson's conclusions were that the autogenous inlay bone graft done under proper conditions was our best method of treatment for most cases of non union in fractures.

Professor Putti and Professor Calve both presented original communications which were well received. Professor Calve's report of plaster and splint methods in high dorsal scoliosis was of especial interest. The symposium on Fractures of the hip to which Dr. Ruth, Dr. Royal Whitman, and Dr. Ridlon contributed, was thoroughly discussed and constituted one of the most important parts of the program. Dr. S. Fosdick Jones of Denver read an especially interesting report of a case of Garre's osteomyelitis. Dr. Kurlander of Cleveland added to his previous contributions on Injuries to the Spine of the Tibia. Sir Robert Jones' remarks upon this paper were also of especial interest. Dr. Steindler of Iowa City gave an especially interesting report upon the results of occupational therapy. Steindler had worked out for arm and shoulder conditions and showed by graphic charts exactly the effects and periods of usefulness of various kinds of employment therapy. The new officers elected were as follows:

Chairman—Dr. H. Winnett Orr, Lincoln, Nebraska.

Vice Chairman—Dr. Willis Campbell, Memphis, Tennessee.

Secretary—Dr. H. B. Thomas, Chicago.

Orthopaedic Titles in Current Literature

Frepared by Dr. J. E. M. Thomson, Lincoln, Nebraska.

Allison, Nathaniel. An adjustable Extension and Suspension, "Balkan" Frame. Surg. Gynec. & Obstet., May 1921, Vol. XXXII, No. 5, p. 459. Tuberculosis of Bone, Results of Study. Archives of Surg., May 1921, 2, No. 3, p. 593.

Attinger, E. Mitral Insufficiency with Polyarthritis and Syphilis. Schweizerische Medizinische Wochenschrift, Basel. April 7, 1921, 51, No. 14, p. 325.

Auerbach, S. Traumatic Injury and the Laws of the Various Types of Paralysis. Neurol. Zentralbl., 1920, XXXIX, p. 753.

Bankart, A. S. B. Postural or So-Called Static Deformities. Brit. Med. J., London, April 23, 1921, 1, No. 3147, p. 587.

Basset, A. Bone Pegging without Arthrotomy in Fractures of the Neck of the Femur-Method of Delbet. J. de Chir., 1921, XVII, p. 81.

Bosch, Arana G. Cinematization of Amputation Stumps. J. de Chirurgie, Paris, April 1921, 17, No. 4, p. 325.

Buschmann, J. H. A Contribution to Primary Sarcoma of the Sternum. Ztschr. f. Path., 1920, XXIV, p. 479.

Campbell, W. C. Central or Intracapsular Fractures of Neck of Femur. Tennessee State Med. Ass'n. J., April, 1921, 13, No. 12, p. 453.

Cohn, I. Normally Developing Elbow. Archives of Surg., May, 1921, 2, No. 3, p. 455.

Corner, E. M. Amputations: the Effect of War Knowledge on Teaching, Practice and After-care. Lancet, 1921, CC, p. 114.

Light Metal Limbs in Above Knee Amputations. Brit. Med. J., London, April 9, 1921, No. 3145, p. 524.

Cotton, A. Reconstructive Surgery of Traumatic Foot and Ankle Deformities. J. of Orthopedic Surgery, May 1921, V. 3, No. 5, p. 196.

Coughlin, W. T. Transplantation of Cartilage. Southern Med. J., April, 1921, 14, No. 4, p. 311.

De Francesco, D. Rotation of the Fragments in Humeral Fractures. Chir. d. Organi di Movimento, 1920, IV, p. 565.

Delageniere, H. Bone-Periosteum Transplants. J. de Chirurgie, Paris, April, 1921, 17, No. 4, p. 305.

Dignan, H. H. Fractured Femur. Calif. State J. of Medicine. April, 1921, 19, No. 4, p. 147.

Dubs, J. Isolated Tearing Fracture of the Acromion due to Muscle Traction. Muenchen. Med. Wchnschr., 1920, LXVII, p. 514.

Dufour, H. Debray and Guyard. Vaccine Therapy of Typhoid Spondylitis. Bull. de la Soc. Med. des Hopitaux, Paris, March 11, 1921, 45, No. 9, p. 364.

Elmslie, R. C. Further Report on a Case of Cyst of the Head of the Tibia. Proc. Roy. Soc. Med., London, 1921, XIV, Sect. Surg., p. 28.

Eloesser, L. Severely but Not Totally Disabled in Industry; Special Reference to One-Armed. Boston Med. & Surg. J., May 12, 1921, 184, No. 19, p. 489.

Escher, A. Sarcomata of the Bones of the Extremities. Arch. f. klin. Chir., 1920, CXIV, p. 545.

Evans, E. L. The Functional Results of Successfully Reduced Congenital Dislocation of the Hip. Proc. Roy. Soc., Med., London, 1921, XIV, Sect. Surg., p. 9.

Multiple Congenital Dislocations. Proc. Roy. Soc., Med., London, 1921, XIV, Sect. Surg., p. 26.

Evatt, E. J. R. Operation for Treatment of Frequent Luxations of Shoulder Joint. Dublin J. of Med. Science, April 1921, No. 14, P. 161.

Fairbanks, H. A. T. Pseudo-Coxalgia; Osteochondritis Deformas Juvenaleis, Lancet, 1921, CC, p. 20.

Orthopedic Treatment of Poliomyelitis. Brit. Med. J., London, April 9, 1921 No. 3145 p. 517.

A Case of Paralytic Subluxation of the Hip with Paralysis of the Adductors. Proc. Roy. Soc. Med. London, 1921, XIV, Sect. Surg., p. 30.

Ficklen, E. A. Report of a Case of Pedunculated Body in the Knee. J. of A. M. A., May 28, 1921, Vol. 76, No. 22, p. 1499.

Fisher, A. G. T. Loose Bodies in Joints. Lancet, London, April 23, 1921, 1, No. 5095, p. 839.

Frankenthal, L. Pathologic Luxation of the Knee in Tabetic Arthropathies. Deutsch Ztschr. f. Chir., 1920, CIV, p. 289.

Friedman, E. Results of Nerve Injuries Apparently Due to Birth Trauma. Boston Med. and Surgery J., May 12, 1921, 184, No. 19, p. 482.

Fuchs, L. A Case of Extramedullary Tumor of the Spinal Cord with Markedly Varying Sensory Disturbances. Neurol. Zentralbl., 1920, XXXIX, p. 625.

Garr, C. C. Abduction Treatment in Fracture of Surgical Neck of Femur. Kentucky Med. J., April, 1921, 19, No. 4, p. 170.

Gibson, Alexander. Dislocation of the Sacro-iliac Joint. J. A. M. A., May 28, 1921, Vol. 76, No. 22, p. 1487.

Gibson, Alexander. Some Aspects of the Mechanism of the Human Foot in Walking. J. Orthopedic Surgery, May 1921, Vol. 3, No. 5, p. 188.
Dislocation of the Sacro-Iliac joint. J. of A. M. A. May 28, 1921, Vol. 76, No. 22, p. 1487.

Goldschmidt, W. A Contribution to the Problem of Sheathing Nerves. Zentralbl. J. Chir., 1920, XLVII, p. 918.

Grossman, J. Fractures of the Forearm in Children. Journal of Orthopaedic Surgery, May, 1921, Vol. 3, No. 5, p. 217.

Hasebe, K. Racial Differences in the Scapula. Arbeiten a. d. Anaf. Institut. d. Univ. Sendai, Japan, Feb. 18, 1921, No. 6, p. 7.

Hayes, M. R. J. Sacralization of Fifth Lumbar Vertebra. Dublin J. of Med. Science, April, 1921, No. 14, p. 152.

Henderson, M. S. Treatment of Ununited Fractures. Annals of Surgery, April 1921, 73, No. 4, p. 487.

Howell, B. W. Fracture of the Pelvis with Dislocation. Proc. Roy. Soc. Med. London, 1921, XIV, Sect. Dis. Child., p. 12.

Internal Derangement of the Right Knee Joint in a Boy Aged 8. Proc. Roy. Soc. Med., London, 1921, XIV, Sect. Surg., p. 31.

Hutchison, H. S., and P. T. Patel. Etiology of Osteomalacia in Bombay. Glasgow Med. J., April 1921, 95, No. 4, p. 241.

Israel, J. G. Subdeltoid Bursitis. Internat. J. of Surg., 1921, XXXIV, p. 8.

Jauregui, P. The Treatment of Pseudarthroses Consecutive to Fracture of the Neck of the Femur. Lemana Med., 1920, XXVII, p. 724.

Jelliffe, S. E. Hypothyroidism and Tabes Dorsalis. N. Y. M. J., 1921, CXIII, p. 383.

Juvara, E. Reconstruction of Upper Tibia. Presse Medicale, Paris, Mar. 26, 1921, 29, No. 25, p. 241.

Kazda, F. Fracture of the Os calcis. Arch. f. Orthop., 1921, xviii, p. 581.

Kelley, J. D. Some Important Fractures Frequently Overlooked. Rhode Island Med. J., April, 1921, 4, No. 4, p. 59.

Koehler A. A Typical Disease of the Second Metatarsophalangeal Joint. Muenchen Med. Wchnschr., 1920, LXVII, p. 1289.

Kuess, G. and L. Houdard. The Ricard Operation: Inter-tibio Calcanear Disarticulation. Rev. de Chir., Par., 1920, XXXIX, p. 465.

Lack, H. L. Case of Leontiasis Ossium. Proc. Roy. Med., London, 1921, XIV, Sect. Laryngoll, p. 1

Langnecker H L. For Better Treatment for Crippled Children. Calif. State Med. J., April, 1921, 19, No. 4, p. 152.

Lenormant, C., and Lebrun, M. Two Cases of Osteosynthesis for Fractures of the Elbow Complicated by Luxation. Presse Med. Par., 1921, XXXIX, p. 41.

Leri, A. and Engelhard. Malformation of First Sacral Vertebra. Bull de la. Soc. Med. des Hopitaux, Paris, April 8, 1921, 45, No. 11, p. 454.

Malone, B. Operative Treatment of Fractures. Tennessee State Med. Ass'n. J., April, 1921, 13, No. 12, p. 455.

Mambrini, D. Solitary Osseous Cysts of the Tibia. Arch. Ital. di Chir., 1920, II, p. 565.

Marshall, H. W. Scoliosis. Boston M. and S. J., 1921 CLXXXIV, p. 31.

Masland, H. C. Integral Traction Providing Splint for Vicious Fractures of Femur. Annals of Surgery, April, 1921, 73, No. 4, p. 495.

Mauclaire, P. Rehabilitation of the Disabled. Progres Medical, Paris, Feb. 5, 1921, 36, No. 6, p. 57.

Meyer, A. W. Unrecognized Occupational Destruction of the Tendon of the Long Head of the Biceps, Brachii. Arch. Surg., 1921, II, p. 130.

Meyer, H. The Behaviour of the Epiphyseal Line in Coxa Vara. Arch. of Orthop., 1920, XVIII, p. 403.

Miller, O. L. Fractures of Lower End of Humerus Involving Elbow Joint. Georgia Med. Assn. J., April, 1921, 10, No. 11, p. 386.

Miller, O. R. Perthes' Disease (Osteochondritis Deformans Juvenilis) Report of Case with Presentation of Patient. Kentucky Med. J., April, 1921, 19, No. 4, p. 172.

Mingazzini, G. Several Cases of Tumors of the Vertebrae and Spinal Cord Treated by Operation. Arch. f. Psychiat. u. Nerveneilk, 1920, LXII, p. 121.

Moreau, L. Direct Fracture of the Calcaneum. Paris Medical, April 16, 1921, II, No. 16, p. 305.

Mueller, W. The Softening and Thickening of the Semilunar Bone, a Typical Disease of the Wrist. Beitr. Z. klin., Chir., 1920, CXIX, p. 664.

Neff, U. A Contribution to Otogenous Acute Progressive Osteomyelitis of the Temporal Bone in Children and Adults. Ztschr. f. Ohrenh., 1920, LXXX, p. 14.

Nossen, H. A Contribution to Subcutaneous Injuries of Tendons. Berlin Ebering, 1920.

Ollerenshaw, Robert. Rotation-Dislocation of the Astragalus. Brit. M. J., 1921, 1, p. 155.

O'Reilly, Archer. Backache and Anatomical Variations of the Lumbo-Sacral Region. J. of Orthopedic Surgery, May, 1921, Vol. 3, No. 5, p. 171.

Owen, W. B. Extensive Tuberculosis of the Hip Joint; Case Report. Kentucky Med. J., April, 1921, 19, No. 4, p. 174.

Palmer, R. J. Acute Infective Osteomyelitis. Grace Hosp. Bull., Detroit, 1921, V, p. 20.

Park, E. A., and J. Howland. Dangers to Life of Severe Involvement of Thorax in Rickets. John Hopkins Hosp. Bull., April, 1921, 32, No. 362, p. 101.

Paton, D. N. and A. Watson. Etiology of Rickets. Brit. Med. J., London, April 23, 1921, 1, No. 3147, p. 594.

Pfeiffer, D. B. Acute Osteomyelitis in Children. Arch. Pediat., 1921, XXXVIII, p. 32.

Platt, H. Surgery of Peripheral Nerve Injuries of Warfare. Brit. Med. J., London, April 23, 1921, 1, No. 3147, p. 596.

Radulesco, A. D. Bone Implants in the Spine. Presse Medicale Paris, April 9, 1921, 29, No. 29, p. 284.

Razzaboni, G. The Radical Operative Treatment of Primary Epitelioma of the Fingers. Chir. d. Organi di Movimento, 1920, IV, p. 511.

Rocher, H. L. and Lasserre. Treatment of Fracture of Joints and of Separation of Epiphysis. J. de Med. de Bordeaux, Feb. 25, 1921, 92, No. 4, p. 92.

Roderick, H. B. Legg's or Perthes Disease; the Differential Diagnosis of Affections at the Hip in Children. Lancet, 1921, CC, p. 210.

Rugh, J. Torrence. Three Frequent Causes of Weak and of Flat Feet. Annals of Surg., April, 1921, 73, No. 4, p. 499.

Scalone, L. The Operative Treatment of Pott's Disease. Chir. d. Organi di Movimento, 1920, IV, p. 505.

Serfaty, M. Myxomatous Angioma of the Biceps Muscle of the Right Arm. Semana Med., 1920, XXVII, p. 888.

Shoemaker, J. Treatment of Long Standing Dislocations of the Hip. Surg. Gynec. & Obstet., May, 1921, Vol. XXXII, No. 5, p. 461.

Smith, Arthur L. Etiology, Treatment and Results in 100 Cases of Backache. Nebr. State Med. J., June, 1921, Vol. VI, No. 6, p. 179.

Stern, Walter G. A Case of Bilateral Dislocation of the Hip Joint. J. of A. M. A., May 28, 1921, Vol. 76, No. 22, p. 1496.

Stoffel, A. Deformities Following Injuries to the Nerves and Their Treatment. Muenchen. Med. Wchnschr., 1920, LXVII, p. 1312.

Stropeni, L. Isolated Fracture of a Supernumerary Bone in the Tarsus. Arch. Ital. di Chir., 1920, II, p. 556.

Sundt, H. Tuberculous Hip Disease and Its Simulants. Tubercle, London, April, 1921, 2, No. 7, p. 289.

Szubinski, A. The Transplantation of Bands of Fascia in the Treatment of Paralysis of the Trapezius. Zentralbl. f. Chir., 1920, XLVIII, p. 12.

Troell, A. Tendovaginitis—and Tendinitis—Stenosans. Svenska Laekartidningen, 1920, XVII, p. 961.

Usland, O. Isolated Tearing Fracture as a Sport Injury. Med. Rev., 1920, XXXVII, p. 285.

Vallery-Radot, Pasteur, H. Stevenson and E. Fatou. Paget's Bone Disease with Wassermann Reaction. Bull. de la Societe Med. des Hopitaux, Paris, March 11, 1921, 45, No. 9, p. 339.

Van de Elst, M. The Treatment of Diaphyseal Fractures. Arch. med. Belges, 1920, LXXIII, p. 824.

Villar, R. "Oyster Shell" Fracture of Patella. J. de Med. de Bordeaux., March 10, 1921, 92, No. 5, p. 121.

Weil, P. E. Typhoid Bone and Joint Disease. Bull. de la Societe Med. des Hop. Paris, April 8, 1921, 45, No. 11, p. 449.

Werner. Radium Emanations in Treatment of Chronic Arthritis. Therapeutische Halbmonatschefte, Berlin, Dec. 15, 1920, 34, No.24, p. 172.

Wislocki, G. B. Experimental Observations on Bone Marrow. John Hopkins Hosp. Bull., April 1921, 32, No. 362, p. 132.

Zimmerman, B. F. Diagnosis and Treatment of Peripheral Nerve Injuries. Kentucky Med. J., April, 1921, 19, No. 4, p. 160.

Current Orthopaedic Literature

TWO UNUSUAL NERVE LESIONS. By Alexander Gibson, M. A., M. B., Ch. B., F. R. C. S. (Eng.), F. R. S. E., Winnipeg, Manitoba. *Surgery, Gynecology and Obstetrics* December, 1920.

In this article two case histories are detailed, one military, the other civilian, to illustrate the importance of precise anatomical knowledge in dealing with nerve surgery.

The first case showed twitching of the muscles of the right side of the face, accompanied by cutaneous hyperaesthesia and a tendency to lacrimation.

The symptoms were due to scar tissue involving: (1) twigs from the infra-orbital branch of the maxillary division of the trigeminal, and (2) the buccinator branch of the mandibular division of the same nerve. The irritation of this scar tissue produced heightened irritability of the motor and secretory nerves corresponding.

The second case occurred in a butcher who presented atrophy of the left interossei but no sensory disturbance and no atrophy of the hypothenar eminence. The condition in this case was a pressure neuritis due to grasping the hide in skinning the animal. A tender spot was present in the palm of the hand corresponding to the point of maximum pressure. As far as can be made out this is a somewhat rare example of an industrial malady.—*A. Gibson.*

CYTOLOGIC INVESTIGATION OF TUBERCULOUS JOINT EFFUSION. By Walter Pewny. Wien. kl. Woch. 1921 No. 3, page 23.

In arthritis with effusion it is occasionally difficult to differentiate between a tuberculous and other processes. The author has therefor made cytological examinations of exudates from knees to throw more light on the differential diagnosis.

In tuberculous arthritis without involvement of bone he found in the exudate between 2000 to 3000 leucocytes. The relation between leucocytes and lymphocytes has been 70:30. The absolute number of lymphocytes was around 1000. In case with mild bone involvement the white cells grew to 10,000 to 20,000, while marked bone infection raised the numbers to 400,000. The albumin contents of the exudate varied in different conditions: in exudate from simple synovitis of the knee he found 30 to 40 per mill., in that from joints with hypertrophic changes 50 per mill. while in a purulent effusion of knee 80 per mill. The lowest figures were obtained in traumatic effusions.

The author claims that this cytologic examination of the exudate is a valuable aid in the differential diagnosis of knee joints with effusion.—*A. Gottlieb, San Francisco, Calif.*

TENODESIS OF THE QUADRICEPS TENDON. Alfred Saxl. *Wien. kl. Woch.* Febr. 17, 1921. Page 71.

In complete paralysis of the leg, fixation of the knee alone will enable the patient to walk or stand. To gain this ability a splint, brace or arthrodesis of the knee joint is usually practiced. Arthrodesis of the knee joint is not practiced successfully in individuals below the age of 18, the author therefor recommends tenodesis of the quadriceps tendon instead. This operation leaves the joint and its capsule uninjured and is indicated in young individuals.

The author has performed this operation in five cases and has gained good results.—*A. Gottlieb, San Francisco, Calif.*

TEMPORARY NAILING OF FRAGMENTS IN FRACTURES AND OSTEOTOMIES. By Johannes Elsner. *Zeitschr. f. Orthopaed. Chirurgie*, XXXIX B. 1. Heft. Seite. 91. 1919.

In osteotomies and fractures near or through a joint the operator frequently encounters difficulties in holding the fragments, especially the one located proximally, in good apposition. The same uncertainty one has when placing the fracture in plaster cast without control of the Xray.

Temporary nailing with a long, preferably gilded, nail guards against this difficulty. The nail is introduced perpendicularly to the fragment above or below the site of bone division or better into the fragment near the joint. The nail protrudes through the skin. The protruding nail or nails enable the operator to manipulate the fragments into the desired position, to always judge in what relation the fragments are to each other and to fix the fractured or osteotomised bone perfectly in plaster of Paris without fear of displacement.

The nails or screws are kept in position for 2 to 3 weeks when, after a renewal of the plaster splint,they are removed. No serious consequences after such nailing the author has ever encountered although he has applied this method in over one hundred cases. A description of nailing in cases of coxa vara, genu varum and in fractures of the elbow follows.—*A. Gottlieb, San Francisco, Calif.*

RECOVERY OF NEEDLE FROM TENDON OF FLEXOR LONGUS HALLUCIS. W. Howard Barber. *Med. Record*, Oct. 30. 1920.

E. G. drove a needle into heel in 1920. During the past few days she has complained of pain in arch on walking. Tenderness is present under left plantar arch and stereoscopic X-ray shows foreign body underlying shaft of first metatarsal. Under guidance of anterio-posterior and lateral views, incision reveals a 3 cm. rusted needle within the fibres of the flexor longus hallucis. The stiffness of this portion of the tendon as though it may be calcified draws attention to it. Of special note in this experience are: the ten year interval, the progression of the needle, and the importance of the X-rays in localization.

THE SECOND GREAT TYPE OF CHRONIC ARTHRITIS, A LABORATORY AND CLINICAL STUDY. Leonard W. Ely. *Archives of surgery* 1920, i. 158.

In this type of arthritis the author includes cases called arthritis deformans by the Germans, osteoarthritis by the English, hypertrophic arthritis by Goldthwait, degenerative arthritis by Nichols and Richardson, etc., etc. His clinical material consists of 90 patients seen at the Stanford clinics. His pathological material consists of fragments removed from many joints and of four femoral heads and one knee joint gained at resection. The clinical diagnosis was made by the Roentgen plate. If this showed spurring and lipping, the case was included in the series. The authors conclusions are as follows:

1. The great second type of arthritis has two distinguishing features: (a) bone production (lipping, spurring) at the joint line, and (b) absence (except in spinal involvement) of union between the ends of the bones, either fibrous or bony.

2. Its main pathologic feature is the presence of areas of aseptic necrosis in the bone near the articular surface. This is the primary change. The cartilage changes and the bone production are the result of it.

3. Its primary cause is probably infection in the alveolar processes of the jaws.

4. Infection in the jaws causes only this type of arthritis, never the first type

5. The infections which cause the first type, namely, tuberculous, syphilis, tonsillar and deep urethral infections, never cause this second type. The evidence for 3, 4, and 5 is purely circumstantial. It rests on clinical observation exclusively.

6. Mental emotion and disturbed digestion can only be considered as contributing causes, which change the secretions of the mouth, and make the infection in the jaws more active.

7. Trauma is effective only as straining a joint already mechanically damaged.

8. This is called the senile type of arthritis, merely because elderly people are prone to it. Alveolar infections are more common in the aged. It occurs occasionally in young people whose teeth and jaws are infected.

CUTTING THE BONE FLAP IN CRANIAL SURGERY. H. C. Masland, M. D. *Annals of Surgery*, October 1920.

Dr. Masland discusses the various methods now used in opening the skull. The chief deficiencies of the more modern instruments are the possibility of injuring the underlying soft tissues and the wastage of bone. The relatively wide fibrous union of the bone flap does not furnish a rigid underlying bone support.

For cranial operations he uses part of an equipment designed for plastic bone surgery in general. The low speed motor eliminates burning. The cable

is ample in strength and is sterilizable. A Roberts trephine and a circular saw do the bone cutting. The small trephine is so constructed as to jam in the side wall and stop the motor the instant the resistance against the crown cutters is removed. The dura remains intact. The saw has an adjustable outside guard for preliminary partial depth cutting. The inside guard is attachable to the instrument. It is inserted in the trephine openings and dissects the soft tissues from the bone. It always intervenes between the saw and the separated soft tissues. A large flap offers operative advantages and no mechanical disadvantages. The distal side of the bone flap on reposition comes in positive contact with and is supported upon its adjoining skull wall.

THE OPERATIVE TREATMENT OF INFANTILE PARALYSIS.

The surgeon who treats paralysis of the lower limbs, takes a novel and rather peculiar view of the requirements of human activity. In this scale of requirements he recognizes three essentials: (1) That the patient should be able to stand on his feet and progress in some manner or other; (2) that he should be able to get up and down out of a chair; and (3) that he should be able to go up and down stairs. In regard to the treatment of patients who cannot walk, Robert W. Lovett (Surg., Gynec. and Obstet., January, 1921) contends that any patient of average intelligence with flaccid paralysis of the lower extremities, abdomen and back can be made to walk in some form or other, provided he has one good arm and one good enough to hold a crutch. The most common obstacle to putting a patient on his feet is contracture of the hip in flexion. This may be remedied by Soutter's operation (fasciotomy with detachment of the muscles surrounding the anterior superior spine of the ilium) or, in milder cases, by continuous stretching. Permanent flexion of the knee may prevent walking and is to be treated by gradual stretching. Equinus deformity of the foot is the third deformity which, if existing in both legs, makes walking practically impossible. In the treatment of this deformity tenotomy should be used with extreme caution. The contracture will in most cases yield to gradual stretching. After correction of the deformity the patient should be instructed in tripod walking. Crutches form the two anterior legs of the tripod, while the third and posterior leg is formed by the body of the patient inclined forward at its upper part with the feet well behind. Hyperextension at the hips is checked by the ilio-femoral ligament, the knees are held in splints and the weight falls in front of the hip joints and enables the patient to stand upright. The power of progression can be acquired. The most interesting and important problem in the treatment of infantile paralysis is that of improving the walk of those patients who are able to move about. In dealing with lameness the surgeon should carefully examine the abdominal and gluteal muscles. Correction of deformity in the feet will not greatly improve the patient's condition if these muscles are paralysed. The limp caused by paralysis of the gluteal muscles cannot be concealed or remedied by any apparatus, but is minimized by the use of a strong elastic band. The abdominal paralysis is much more common than has generally been supposed. The complicated limp may be minimized by

wearing a well-fitting corset. In the treatment of deformities due to paralysis, tendon transplantation has been successfully employed by the author, more especially by fixing the extensor hallucis longus tendon to the first metatarsal bone in cases of mild valgus deformity and by transferring the peroneus longus tendon to the medial side of the foot and by insertion of the tibialis posterior and one of the peroneal muscles into the os calcis in cases of talipes calcaneus. Tendon fixation has been proved to be satisfactory, although occasionally the tendons were stretched or pulled out of their attachments. Silk ligaments have been discarded. Astragalectomy when performed after the age of fourteen years is a good operation, but in young children the astragalus should only be removed in cases of severe calcaneus deformity. In cases of paralysis of the upper limb the minimum requirements for a successful operation are, firstly, power of flexion of hand and fingers and, secondly, ability to move the scapula on the thorax. Arthrodesis of the shoulder is the best procedure when there is paralysis of the deltoid. In the hand tendon transplantation is often of use, particularly for the improvement of the movements of the thumb.—*From The Medical Journal of Australia.*

A Study of Persistent Bone Sinuses. Dr. Charles Peabody, *Journal of S., G. and O.....November*, 1920.

The author was concerned in the treatment of some 500 A. E. F. cases arriving at general hospitals in this country after the armistice; and presenting persisting bone fistulae in spite of much and varied treatment and after running a protracted and stormy course. The pathology in all was similar, old compound comminuted fractures from gun-shot wounds followed by chronic osteomyelitis, and the resulting condition was proving a permanently intractable one by the persistence of the following factors: a bony chamber, infected and filled with fungosities, and surrounded by sclerosed, unregenerative and incollapsible walls. Many modes of attack were observed with varying results, and from them a method of treatment was evolved and carried out on the cases operated by the author, about half the above number, which seemed to promise a permanent cure in a large majority. It consisted of an extremely radical ablation operation removing the entire area surrounding the lesion, and leaving in the bone a shallow basin instead of a deep cavity. The resultant healthy but still bacteriologically contaminated wound was kept wide open under rigid Carrel-Dakin technic until sterilization was complete and the bone buried under healthy granulation tissue, which required from two to six weeks. As complete cicatrization in this fashion was frequently unsuccessful and usually functionally disadvantageous, the wound at this stage was closed by a second operation usually performed under infiltration ansthesia, in which a free reconstruction of tissue planes was made, swinging pedicled flaps when necessary to fill dead spaces or meet a skin deficiency, thus minimizing scar tissue and thereby improving function. The healed wounds were successfully subjected to the therapeutic test of deep and prolonged massage, but lapse of time alone in these conditions can be held as an adequate criterion of cure.—C. P.

Harmer, T. W. *Boston Medical & Surgical Journal*, 1920, December 30, p. 775.

In the hope of dispelling a very general belief that operation should be postponed in cases of spina bifida until the child is stronger, Harmer presents a paper on the operability and time for surgical intervention in various forms of spina bifida based upon an operative experience of 38 cases with an operative mortality of 42.1 per cent. His series includes 8 meningoceles, 26 myelomeningoceles, 3 hydroencephaloceles, and 1 encephalocele. Of these 27 were rounded and sessile, 8 rounded and pedunculated, and 3 flat and entirely covered with membrane. Twenty-two cases had ulcerated or leaking sacs. The 17 deaths were due to meningitis, continued loss of cerebro-spinal fluid, acute hydrocephalus, and shock. Harmer has presented his technique of operating in a previous paper in the Boston Medical & Surgical Journal, September 13, 1917.

He summarizes his views on operability and time for surgical intervention as follows:

Rounded pedunculated sacs, entirely covered with skin, without paralysis —operation may be safely deferred for a long time, but it is better judgment to adopt the same criterion for operative interference as in the rounded sessile type.

Rounded sessile sacs, entirely covered with skin, without paralysis-operation should not be deferred longer than is necessary to determine that an equilibrium between secretion and absorption of cerebro-spinal fluid has been established, i. e., not longer than several weeks after the sac has reached its maximum size.

Rounded sessile sacs, entirely covered with skin, with paralysis-operation at once in the hope of forestalling inextricable adhesion of nerve elements. Post-operative hydrocephalus may occur but if we wait for signs of hydrocephalus to appear, we will likely miss the opportunity to cure paralysis by operation. Non-adherent nerve elements in the sac may be successfully replaced within the spinal canal, but nerve elements involved in granulation tissue of the sac cannot be successfully extricated.

Rounded sessile sacs, entirely or partly covered with membrane, without paralysis. With scrupulous care of the sac, a delay of a few days is justifiable to demonstrate the unlikelihood of post-operative hydrocephalus. Delay beyond this means excoriation and infection of the sac and poorer operative prognosis.

Rounded sessile sacs partially or entirely covered with membrane, with paralysis-operation at once, in the hope of finding nerve elements which are not inextricably adherent to the sac. With the head obviously hydrocephalic, operation is not justifiable.

Defects covered entirely with flat membrane, when narrow and with or without paralysis-operation at once.

Sacs entirely covered with flat membrane, when wide and with paralysis-operation unjustifiable.

THE AFTER-TREATMENT OF A DISLOCATED ELBOW. Ernest T. Saeger, M. D. *Boston Med. & Surg. Journal*, Nov. 4, 1920.

The use of early passive motion and massage following reduction of a dislocated elbow is contra-indicated because of the danger of formation of ossification in the neighboring muscles. The arm should be immobilized in acute flexion for three weeks in order to make the development of myositis ossificans traumatica less likely. The elbow joint seems to have a greater tendency than other joints to the formation of nodules of ossification in the muscles following trauma. The origin of new bone formation may be from osteoblastic cells which have wandered from the torn periosteum and proliferated, or it may be a metaplasia of the connective tissue of the capsule or intermuscular septa.

The case reported in this article was reduced under ether in the usual manner. The arm was flexed to an angle of about 60 degrees and immobilized for a period of three weeks. The arm was then given daily periods of baking, massage, and passive motion. Six weeks after reduction there was still marked limitation of extension. X-ray plates were made and showed no evidence of myositis ossificans. As the limitation of motion seemed due entirely to joint adhesions, the patient was again given a general anesthetic until there was muscular relaxation, and the adhesions were broken up without difficulty. Six weeks after the last anesthesia the patient was discharged with no limitation of motion at the elbow joint and no deformity.

Unfortunately in these cases the period of immobilization will almost certainly result in the formation of firm joint adhesions which will have to be broken up under general anesthesia. This treatment is wiser, however, than to permit nodules of ossification to form which will have to be removed surgically.

TRANSPLANTATION OF CARTILAGE. By W. T. Coughlin, M. D. F. A. C. S., St. Louis, Mo.

In the past 8 years and more particularly in the last 4, much attention has been given to the transplantation of cartilage. At Cecis' Clinic in Pisa, Italy, during the Turco-Italian war, the process came first prominently into notice.

In war wounds of the face, where loss of the underlying hard parts rendered the deformity more pronounced, resort was had to cartilage implantation for the purpose of overcoming the skeletal defects.

Cartilage lends itself most readily to transplantation. It is easy of access. The supply furnished by the individual himself is practically unlimited. Its removal does not impair his function nor leave disfigurement or deformity. It is easily worked into the desired form. It requires no elaborate mechanical device for its removal or reimbedding, and as far as we are yet able to determine, it continues to live and retain its shape and size, and lastly, it must be mentioned that it is not so susceptible to the action of pyogenic organisms as are other grafts. It often heals in firmly, even after long suppuration of the wound.

Heteroplastic grafts do not long survive, but are absorbed and their place is taken by scar tissue.

J. S. Davis, in a series of experiments, concluded that even without any perichondrium the graft remained unabsorbed.

Bone requires, when transplanted, to be placed in contact with living bone and to be made to functionate, otherwise it is either absorbed or atrophies. Cartilage, imbedded anywhere in the tissues, retains its form and strength apparently indefinitely, unless subjected to greater stress of weight than that which it formerly carried.

For transplantation into the skull, costal cartilage is taken, split in the coronal plane and applied to the defect in a manner to conform with the skull contour. The periosteum loosened from the skull, the beveled cartilage placed in the skull and the periosteum stitched to it. The perichondrium is not removed from the graft. Perfect hemostasis is desired, sepsis is not to be feared as in bone grafts, as cartilage is much more viable. Union is fibrous. The graft seldom slips or becomes broken.—*Leo C. Donnelly, Detroit.*

FISSURE FRACTURE OF THE TIBIA. By Jacob Grossman, M. D., New York City, New York. *New York Medical Journal*, Sept. 11, 1920.

This paper is based on the study of twenty-one cases. It occurs commonly before ten years of age. It is the result of direct violence. The following conclusions are drawn:

1. Fissure fracture occurs mostly in children.

2. The tibia is usually the site of the fracture, only one case having been found in the fibula.

3. The subjective symptoms and the disability may be very mild.

4. Fissure fracture should be differentiated from sprains and contusions.

5. The presence of a luetic infection in the bone, as a factor prolonging the duration of the symptoms, should not be overlooked.

6. False mobility, crepitus and deformity are always lacking in this type of fracture.

7. The diagnostic objective symptom is "pencil tenderness." It is always present and persists for an indefinite period of time after the accident has occurred.

8. The recognition of this type of fracture is important, not only from a scientific viewpoint, but also from a medicolegal viewpoint.

9. The treatment consists of immobilization by means of plaster-of-Paris bandages, which are retained for a period of two weeks. They are then removed and baking and massages are given. The average length of time treatment was necessary was four weeks.

SUBLUXATION OF THE HEAD OF THE RADIUS. By Dr. Jacob Grossman, New York City, N. Y. *Medical Record*, Dec. 11, 1920.

This paper is based on the study of thirty-seven cases. It is also known as "traumatic palsy," because it resembles a flaccid paralysis. It occurs commonly between the ages of a few months and five years. Swinging the child by the wrists or dragging the child by taking hold of the wrist is the common cause. Immediately thereafter the upper extremity hangs limply at the side and the child refuses to move it.

The writer concludes as follows:

1. Subluxation of the head of the radius is a fairly common condition and is often overlooked. It is often diagnosed as sprain of the shoulder or wrist, or fracture of the forearm.

2. It occurs only in children, generally between the ages of eight months and five years.

3. The mode of production and the subsequent picture, namely raising or dragging the patient by gripping the wrists and the apparent flaccid paralysis, are characteristic of this condition.

4. It is often called "traumatic palsy of the upper extremity.

5. Extreme forcible supination is all the treatment required to overcome the subluxation. After care is not necessary.

6. As relapses may occur parents should be warned of the risk of dragging or lifting their children by gripping the wrists.